No. of Printed Pages : 5 **ET-105(A)**

B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering)

BTCLEVI/BTMEVI/BTELVI/BTECVI/BTCSVI

Term-End Examination

June, 2012 01499

ET-105(A) : PHYSICS

Time : 3 Hours *Maximum Marks : 70*

Note : *Attempt all questions. Internal choices are provided. Assume missing data suitably, if any.*

1. (a) What do you mean by electric dipole ? Derive an expression for the total work done in rotating an electric dipole through an angle θ in a uniform electric field. **6**

OR

Using Guass theorem, show that for a spherical shell, the electric field inside the shell vanishes, whereas outside it the field is as if all the charges were concentrated at the centre. **6**

(b) The area of the parallel plate capacitor is $0.20m^2$ and distance between them is 0.01m. The potential difference between the plates is 3000 V. When a 0.01m thick dielectric is placed between the plates, the potential difference decreases to 1000V. Determine capacitance of a capacitor before placing the dielectric and after placing it. **4**

(c) (i) If the electric field near the earth surface be 300 V/M directed downward, what would be the surface charge density on earth surface ? 4

OR

(ii) Compute the potential gradient at a distance of 1.0×10^{-12}m from the centre of the gold nucleus . The atomic number of gold is 79. 4

2. (a) Discuss the formation of standing waves on a string of fixed length. 6

OR

Define interference. Explain how Newton's rings with bright central band can be obtained in reflected system ? 6

(b) Fraunhoffer diffraction pattern is observed for light of wavelength 600nm passing through a single slit. The angle subtended at the slit by the minima on either side of the central maxima is 0.12 radians . Find slit width. 4

(c) (i) A particle executes S.H.M. of amplitude 'a'.At what distance from the mean position is its kinetic energy equal to potential energy ? 4

OR

(ii) Newton's rings are formed between a plane glass surface of a plano convex lens. The diameter of the third dark ring is 10^{-2}m. A light of wavelength 5890 A° is used at such an angle that the light passes through the air film at an angle of 30°. to the normal . Find the radius of curvature. 4

3. (a) Find the moment of inertia of right circular cone of base radius 'R' and height 'h' 6

OR

State and prove theorem of perpendicular axis for moment of inertia.

(b) A solid cylinder rolls down an inclined plane. Its mass is 2kg and radius is 0.1m. If the height of the inclined plane is 4m, what is rotational kinetic energy when it reaches foot of the plane ? Take moment of inertia of solid cylinder about its axis as $(1/2)mr^2$. 4

(c) (i) An electron of mass $9x10^{-31}kg$ revolves in a circular orbit of radius 0.53A° around a nucleus of hydrogen with a velocity of $2.2x10^6m/s$. Show the angular momentum is equal to $h/2\pi$. 4

OR

(ii) Calculate the moment of inertia of HCl molecule about an axis passing through the centre of mass and perpendicular to the line joining the atoms of HCL molecule. The distance between hydrogen and chlorine atom is 1.275A°. Given MH=1.00 a.m.u, mcl=35.5 a.m.u, 1a.m.u=$1.66x10^{-27}kg$, 1A° = $10^{-10}m$. 4

4. (a) What are conservative and non-conservative forces ? Show that work done by a conservative force along a closed path is zero. 6

OR

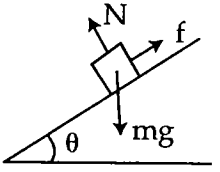
What is meant by inertial and non-inertial frame of references ? Is earth an inertial or non-inertial frame ? Give justification.

(b) A ball is thrown vertically upward and reaches a height of 90m. Find the velocity with which it was thrown. How far the ball will be from its starting point 0.7/ sec after it was thrown ? 4

(c) (i) A string of length 20 cm is tied at one end and a mass of 10 gm attached to its second end so that string remains horizontal. When mass is released, calculate velocity at lowest point of swing of mass ? 4

OR

(ii) A body of mass 'm' slides down an inclined plane having a coefficient of kinetic friction 'μ'. Find the acceleration of the body. 4



5. (a) State Biot-Savart's law for the magnetic field produced at a point due to current element. Find the magnetic field at a point due to current flowing in a long straight conductor. 6

OR

A charged particle is moving with velocity $\vec{V}$ in a plane perpendicular to a uniform magnetic field $\vec{B}$. Obtain an expression for time taken by the particle to complete one revolution of the circular trajectory.

(b) A stream of electron travelling with a velocity of 3×10^7 m/s is deflected in passing through an electric field of 1800 v/m, perpendicular to its path. If the radius of deflected beam is 3m, calculate the specific charge of electron. **4**

(c) (i) A closely wounded solenoid 80cm long has layers of windings of 400 turns. The diameter of solenoid is 1.8cm. If the current is 8A, calculate the magnitude of **B** inside the solenoid near its centre. **4**

OR

(ii) Consider the circular trajectory of radius 0.3m of a 6 Mev proton in a field $\vec{B}$. Calculate the radius of the path a 12 Mev alpha particle in the same field. **4**

Physical Constants :

$e = 1.6 \times 10^{-19} C$

$\frac{1}{4\pi\epsilon_o} = 9 \times 10^9 C^2/(Nm^2)$.

$\frac{\mu o}{4\pi} = 10^{-7}\ N/A^2$.

$\epsilon_o = 8.85 \times 10^{-12}\ C^2\ N^{-1}\ M^{-2}$.